

New mosses of North America. I.

F. RENAULD AND J. CARDOT.

(WITH PLATES XIII-XX.)

Dicranella Fitzgeraldi.—Cespitose, yellowish or dirty green. Stems 5–15 mm. long, simple or bipartite. Leaves crowded, subsecund, from a lanceolate base gradually narrowed into a long subulate canaliculate point, denticulate at the apex; 3–3½ mm. long, ⅓ mm. broad; costa broad, ⅓ width of leaf-base, occupying nearly all the point; cells of the areolation rectangular or subrectangular, firm, more or less elongated. Perichæcial leaves from a dilated sinuate-denticulate base abruptly subulate, denticulate at the apex. Pedicel yellowish, 7–15 mm. long, twisted to the left, but rather to the right above. Capsule erect, symmetric, oblong, not constricted under the orifice, very slightly plicate when dry, brown or yellowish; length 1½ mm., diameter ⅓ mm.; lid convex, obliquely long rostrate; teeth purple or orange-colored, densely trabeculate, striolate lengthwise, faintly granulose, cleft to below the middle into two very long-subulate legs, quite free or partly connected. Male flowers unknown.

Florida: on sandy ground near Palatka (*Fitzgerald*).

This species is readily distinguished from *D. heteromalla* by the symmetric erect capsule, and the teeth of the peristome cleft to below the middle into two narrower and more elongated legs. It is more closely allied to *D. stenocarpa* Besch., a tropical species from Martinique and Guadaloupe islands, from which it differs in its more acute leaves, denticulate at apex, the capsule not constricted under the orifice, and the peristome less papillose.

Sterile specimens gathered in Louisiana by Mr. A. B. Langlois, which we had at first referred to *D. heteromalla*, may belong to *D. Fitzgeraldi*.

Campylopus Henrici.—Cespitose, yellowish green. Stems very short, without tomentum. Leaves slightly secund, lanceolate-subulate and semitubulose from an oblong base,

the upper generally tipped with a short hyaline denticulate and often broken point; 3-4 mm. long, $\frac{1}{2}$ mm. broad; basilar cells rectangular, 3-4 times longer than broad, those of the angles sometimes rather soft and yellowish, but not forming distinct auricles, the upper elongated, straight, linear; costa broad, about $\frac{1}{3}$ the width of leaf-base, of 4-5 strata of cells, 2-3 inferior of small thick-walled cells, one median of large thin-walled cells, and one superior of small thin-walled cells, this often incomplete, and then occupying only the middle of the costa. Male flowers small, gemmiform, placed near the top of the stems; bracts ovate, concave, rather suddenly acuminate, thin-nerved; antheridia rather numerous, with some paraphyses. Female flowers and capsule unknown.

Kansas: Saline County, on sandy ground, where it was discovered by the late *Joseph Henry*.

Resembles a stunted form of *C. brevipilus* B. S., and has also rather the appearance of *C. brevifolius* Sch. Differs from the first by the straight rectangular thin-walled cells of the areolation; from the last by the nerve less broad, the leaves often hyaline at the apex and the cells elongated; and from both by the structure of the costa.

Rhacomitrium Oreganum.—Robust, in wide yellowish tufts. Stems prostrate and a little naked below; branches erect, 4-5 cm. long, simple or dichotomous, and with very few short branchlets. Leaves appressed when dry, erect-spreading when moist, generally more or less homomallous at the top of the branches, ovate, or broadly ovate-lanceolate, acuminate, carinate, slightly plicate below, sometimes obtuse, generally acute, mucous or with a short hyaline apiculus or a more or less elongated, shortly decurrent, slightly serrulate hair-point; borders revolute from the base to near the apex; costa percurrent, prominent on the back; cells thick-walled, linear, very sinuous, the lower most elongated, the upper 2-4 times longer than broad, slightly papillose. External perichætal leaves shortly piliferous, the inner mucous, of a more delicate texture of thin-walled and scarcely sinuous cells. Pedicel reddish, paler above, twisted to the left, 12-18 mm. long. Capsule oblong-cylindrical, brownish, 3-3 $\frac{1}{2}$ mm. long, 1 mm. broad; lid long-beaked; annulus large; teeth purple, very long, cleft to the base into two filiform, often unequal, nodulose and faintly papillose legs; calyptra conical, long-acuminate, brownish at apex, laciniate-lobulate at base.

Oregon: on rocky hill-sides. (*Th. Howell.*)

A remarkable species, intermediate between *R. canescens* and *R. heterostichum*, but more closely allied to the last, from which it differs by the aspect, the yellowish color, the robustness and thickness of the stems, the pedicel twice longer and the teeth much more elongated. It is at first sight distinguished from all the forms of *R. canescens* by the percurrent costa, the hair not papillose, and the capsule cylindrical, not inflated below. Its simple or scarcely ramulose branches give to this species rather the facies of a *Dryptodon*.

Webera camptotrachela.—Stems erect, slender, simple or with few branches, 5–10 mm. long. Leaves little crowded, erect, narrowly oblong-lanceolate, acuminate, acute, $1\frac{1}{4}$ – $1\frac{1}{2}$ mm. long, $\frac{1}{3}$ mm. broad; borders plane or slightly revolute below, distantly denticulate in the upper part; costa strong, percurrent; cells of the areolation elongated, subhexagonal or rhomboidal, 6–10 times longer than broad. External perichæatial leaves more elongated, long narrowed-acuminate, more or less revolute on the borders, serrulate, with the costa generally excurrent; 2 or 3 inner bracts, smaller and shorter. Pedicel reddish, flexuous, often geniculate at base, 20–25 mm. long. Capsule small, sub-horizontal or cernuous, oblong-subpyriform, tawny-brown, with a long attenuated curved collum; lid convex, apiculate; annulus formed of two rows of cells; teeth yellowish, densely trabeculate; segments of the inner peristome generally imperfect; cilia variable in length. Male plant distinct.

California.

Very closely allied to *W. annotina* (of which it may be only a sub-species), but differing in its curved collum and the imperfection of the inner peristome, which is often reduced to a single membrane irregularly laciniate.

Polytrichum Ohioense Ren. & Card. *Revue Bryologique*, 1885, p. 11.—Stem erect, simple or bipartite, 3–6 cm. long, a little tomentose below. Leaves spreading when moist, erect-flexuous when dry, from a sheathing base, linear-acuminate, cuspidate, serrate; lamellæ about 50, each in section of a row of 5–7 cells, the marginal one much larger, transversely dilated, about twice broader than high, very slightly convex, often almost plane. Perichæatial leaves longer, with a longer hyaline base. Pedicel 4–8 cm. long, reddish below, pale above. Capsule erect, finally horizontal, tetragonal or pentagonal, rarely hexagonal, acute-angled, rather narrowed

toward the base, with a very small or indistinct hypophysis; length 5-7 mm., diam. 2-2½ mm.; lid conic-acuminate, red at margin.

We originally described this very good species in 1885, in the *Revue Bryologique*, upon specimens gathered in Ohio by Mr. Provost. Since then, Mr. H. A. Green communicated to us this moss as *P. formosum* from N. Carolina, Crowdin Mount, and Mr. Ch. R. Barnes from several localities of New Hampshire (*Bailey*) and Wisconsin (*Lapham*). We have also recognized it in a specimen issued as *P. formosum* in Sulliv. et Lesq. *Musci Bor. Americani* no. 323, without locality. Besides, Mr. Barnes wrote us lately: "I have had all our *Polytrichums* carefully studied. We found your *P. Ohioense* far commoner than *P. formosum*; indeed, we have no specimen of *P. formosum* in our collections from N. America. We have *P. Ohioense* from Lafayette, Indiana; summit of Mt. Mansfield, Vermont; Dells of the Wisconsin, Milwaukee and Manitowoc, Wisconsin." Therefore, it is probable that our species is broadly scattered in the United States, where hitherto it has been confounded with *P. formosum*, from which it is readily distinguished by the form of the capsule, more or less narrowed toward the base, and with an indistinct hypophysis, and chiefly by the form of the marginal cells of the lamellæ, a character which separates it from all the other species of *Polytrichum*. The true *P. formosum* seems to be very rare in North America. We have it only from Miquelon Island, near Newfoundland, where it was gathered by Dr. Delamare. In this species, as in *P. gracile*, the capsule is rounded at base, with a distinct hypophysis, and the marginal cells of the lamellæ are in section ovate, higher than broad, and of same size as the others or only a little larger. The *P. commune* is still more different by its very distinct annular hypophysis and the marginal cells of the lamellæ hollowed and semilunar in section.

Fontinalis Howellii.—Rigid, yellowish green. Stem 10-15 cm. long, subligneous, flexuous, naked below, pinnate and partly bipinnate. Branches spreading, for the most part arched downward, of a plumose aspect. Stem-leaves becoming gradually larger toward the top of the innovations, erect-appressed, broadly ovate, shortly acuminate, concave, subcarinate or only plicate, cucullate or lacerate at the apex; upper leaves 5-7 mm. long, 2-3 mm. broad; the lower much smaller. Branch-leaves very different, narrowly lanceolate,

concave, not carinate, long acuminate-tubulose, rigid, erect-spreading, 3-4 mm. long, $1-1\frac{1}{4}$ mm. broad, in three very distinct ranks. Cells of the areolation long linear, rather firm, those of the angles more or less enlarged and generally brownish or ferruginous. Perichæatial leaves rounded-obtuse and lacerate at the apex. Capsule entirely concealed in the perichæatium, 2 mm. long, $\frac{1}{2}-\frac{3}{4}$ mm. broad; lid unknown; teeth about 1 mm. long, narrow, linear-acuminate, slightly papillose, often connected in pairs at the apex, with 20-25 lamellæ on the inside, not perforated on the dorsal line; lattice-cone of the inner peristome strongly papillose, the lower transverse bars appendiculate.

Oregon: on old logs in swamps (*Th. Howell*).

Already in 1881 Mr. Lesquereux communicated to us this plant; but the specimen was poor and sterile. Recently we have received from Mr. Th. Howell good fertile specimens of this very fine moss, which is at first sight distinguished from all congeners by its strikingly rigid aspect, the arcuate branches and the dimorphous leaves, the branch-leaves being narrow and tubulose in the upper part.

Fontinalis flaccida.—Plant very soft, yellowish. Stems slender, naked below, 25-35 cm. long; branches subpinnately ramulose; branchlets spreading, slender, distant. Leaves soft, distant, open, but convolute-imbricate at the top of the ramuli, elongated, narrowly lanceolate, plane or nearly so, obtuse or truncate, and slightly denticulate at the apex; 5-7 mm. long, $1-1\frac{1}{2}$ mm. broad. Cells thin-walled, the median very long, 10-20 times longer than broad, the upper much shorter; those of the angles large, lax, subrectangular or subhexagonal, hyaline or brownish, forming very distinct auricles. Flowers and capsule unknown.

East Louisiana: in the branches and roots overflowed in the Bayou Bonfouca (*A. B. Langlois*).

A remarkable species, readily distinguished, although sterile, by its very soft lax-foliate stems and its long, plane or scarcely concave leaves. The æstival form of *F. biformis* Sulliv., which resembles it by the structure of the leaves, is quite distinct by its rather rigid facies and its leaves shorter, more crowded, less distinctly auricled, erect and convolute-imbricate throughout the length of the branchlets. The *F. filiformis* Sull. & Lesq. and *F. disticha* Hook., which have also some affinities with our species, differ much from it by their facies and their leaves concave, canaliculate or tubulose the upper part.

Camptothecium Amesiae.—Widely cespitose, bright yellowish-green. Stems prostrate, creeping, radiculose, pinnately ramulose, 8–12 cm. long; branchlets crowded, short, equal, erect, a little curved, 5–10 mm. long. Stem-leaves broadly triangular, narrowly long-acuminate. Branch-leaves ovate-lanceolate, shortly acuminate, carinate, plicate, generally plane on one side and revolute on the other, slightly serrulate at the apex, $1\frac{1}{4}$ mm. long, $\frac{1}{2}$ mm. broad; costa vanishing in the acumen; cells of the areolation linear, attenuated, 10–15 times longer than broad, the upper shorter, the alar numerous, quadrate or subrectangular. Inner perichæatial leaves ecostate, narrowly lanceolate and long-acuminate, entire. Pedicel short, 8–12 mm. long, purple, rough, a little twisted to the left. Capsule narrow, long-cylindrical, sub-erect or subhorizontal and slightly arcuate; lid unknown; teeth orange, long acuminate-subulate, strong, densely trabeculate; segments split their whole length; cilia long.

California: Auburn, mixed with *Hypnum pinnatifidum* Sull. & Lesq. (*Mrs. Mary E. Pulsifer Ames*).

This species is intermediate between *Hypnum Nuttallii* Wils. and *H. pinnatifidum* Sull. & Lesq., differing from the first by its branch-leaves not dentate at the base, the teeth of the peristome narrower and more narrowly acuminate-subulate and the cilia longer; from the last by its narrow, long-cylindrical capsule; and from both by its branch-leaves broader and shortly acuminate. By this last character it is related to *H. Nevadense* Lesq., but this species is distinguished by the facies, the mode of growth, the erect symmetric capsule, the inner perichæatial leaves coarsely sinuate-dentate in the upper part and abruptly narrowed into a very long filiform point, and, finally, by the less perfect peristome, characters which compel us to separate this plant from the genus *Camptothecium* and to place it in *Homalothecium* (*H. Nevadense* Ren. & Card.).

Stenay, France.

EXPLANATION OF PLATES XIII–XX.—All figures enlarged 80 diameters or more are copied by means of Nacet's camera lucida:

PLATE XIII. *Dicranella Fitzgeraldi*.—*a*, entire plant; *b b*, stem leaves; *c c*, point of same; *d*, areolation of the base of same; *e*, perichæatial leaf; *f f*, capsule; *g*, lid of same; *h*, portion of the peristome.

PLATE XIV. *Campylopus Henrici*.—*a a*, leaves; *b*, point of same; *c*, areolation of the base; *d d*, transverse section; *e*, male flowers; *f*, bract of same.

PLATE XV. *Rhacomitrium Oreganum*.—*a*, entire plant; *b b b*, leaves; *c c c*, point of same; *d*, areolation of the upper part; *e*, capsule, pedicel and perichæatium; *f*, capsule with the lid; *g*, portion of the peristome.

PLATE XVI. *Webera camptotrachela*.—*a*, entire plant; *b b*, leaves; *c*, areolation of the middle; *d d*, external perichæatial leaves; *e*, inner perichæatial leaf; *f*, capsule with the lid; *g g*, capsule deoperculate; *h*, portion of the external peristome; *i*, portion of the inner peristome.

PLATE XVII. *Polytrichum Ohioense*, compared with *P. formosum*, *P. gracile* and *P. commune*.—*a*, transverse section of the lamellæ of the leaves of *P. Ohioense*; *b*, ditto of *P. formosum*; *c*, ditto of *P. gracile*; *d*, ditto of *P. commune*; *e e*, capsule of *P. Ohioense*; *f*, capsule of *P. formosum*.

PLATE XVIII. *Fontinalis Howellii*.—*a*, entire plant; *b b*, upper stem-leaves; *c c*, branch-leaves; *d*, perichæatial leaf; *e*, capsule; *f*, portion of the external peristome; *g*, portion of the lattice cone.

PLATE XIX. *Fontinalis flaccida*.—*a a*, leaves; *b b*, point of same; *c*, areolation of an auricle; *d*, areolation of the middle.

PLATE XX. *Camptothecium Amesiae*.—*a*, entire plant; *b*, branch-leaf; *c*, areolation of the base of same; *d*, perichæatial leaves; *e e*, capsule with pedicel; *f*, portion of the outer and inner peristome.

Zygomorphy and its causes. II.

CHARLES ROBERTSON.

As soon as a shallow flower becomes horizontal the insect relations change, and certain modifications which would be corrected in vertical flowers become advantageous. While the flower is erect, the horizontal petals form a convenient landing. When the flower turns to one side, the petals become vertical, and the stamens and styles, which become horizontal, form the landing. The flower immediately becomes sternotribe, and this shows how an apparently trivial variation may be of great functional importance. The pollen, instead of being scattered indefinitely on all sides of the insect, is now limited to the under side. It will be advantageous for the stamens and styles to bend so as to strike the ventral surface of the bee with more precision.

The upper nectary, being in front of the landing, is most convenient, and is first to be sucked. To suck the lower nectaries, the bee must turn and hang under the stamens, a very inconvenient operation which causes delay. This view and, in fact, the whole theory stated in this paper was suggested by the action of a bee, *Synhalonia speciosa* Cress.,¹² on the flowers of *Geranium maculatum*.

The flowers are terminal and vertical, or nearly so, and insects light upon the petals. Humble-bees, which seem best adapted to fertilize the flower, pull it down by their weight so as to invert it, as observed by Prof. Macloskie.¹³

¹²The bees mentioned in this paper were named by Mr. E. T. Cresson.

¹³BOT. GAZ. IX, 157.